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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/849,537	05/07/2001	Tonglong Zhang	1875.0370000	7984

7590

10/15/2002

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EXAMINER

LEWIS, MONICA

ART UNIT

PAPER NUMBER

2822

DATE MAILED: 10/15/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application N .

09/849,537

Applicant(s)

ZHANG ET AL.

Examiner

Monica Lewis

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 29 August 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 3-13, 16, 17 and 38-68 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 3-13, 16, 17 and 38-68 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 June 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☒ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4, 5 & 9.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

### **DETAILED ACTION**

1. This office action is in response to the amendment filed April 23, 2002.

#### ***Response to Arguments***

2. Applicant's arguments with respect to claims 3-13, 16, 17 and 38-68 have been considered but are moot in view of the new ground(s) of rejection.

#### ***Election/Restrictions***

3. Applicant's election with traverse of Group I in Paper No. 8 is acknowledged. The traversal is on the ground(s) that the claims are directed to essentially the same inventive concept. This is not found persuasive because searching in a separate area for method (Class 438) and another area for apparatus (Class 257) for two inventions constitutes an undue burden upon the examiner.

The requirement is still deemed proper and is therefore made FINAL.

#### ***Oath/Declaration***

4. The oath or declaration is defective. A new oath or declaration in compliance with 37 CFR 1.67(a) identifying this application by application number and filing date is required. See MPEP §§ 602.01 and 602.02.

The oath or declaration is defective because:

- a) It does not identify the mailing or post office address of each inventor. A mailing or post office address is an address at which an inventor customarily receives his or her mail and may be either a home or business address. The mailing or post office address should include the ZIP Code designation. The mailing or post office address may be provided in an application data sheet or a supplemental oath or declaration. See 37 CFR 1.63(c) and 37 CFR 1.76.
- b) It does not identify the citizenship of each inventor.

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c) It does not identify the city and either state or foreign country of residence of each inventor. The residence information may be provided on either on an application data sheet or supplemental oath or declaration.

***Claim Rejections - 35 USC § 112***

5. Claims 49 and 60-68 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is not clear what is meant by the following: a) "is flush with" (See Claim 49); and b) "window opening that is open at said first surface and said second surface of said substrate" (See Claim 60). Claims 61-68 depend directly or indirectly from a rejected claim and are, therefore, also rejected under 35 U.S.C. 112, second paragraph for the reasons set above.

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 3, 8, 4-6, 8, 42-46, 48-50, 60, 64, 65 and 67, as far as understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Li (U.S. Patent No. 6,163,458) in view of Kalidas et al. (U.S. Patent No. 6,084,777).

In regards to claim 38, Li discloses the following:

- a) a substrate (10) (See Figure 2);
- b) plurality of solder ball pads (16) on a second surface of said substrate (See Figure 2);

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c) a heat spreader (50) that has a first surface and a second surface, wherein said first surface of said heat spreader is attached to said second surface of said substrate (See Figure 2);

d) second heat spreader surface is configured to be coupled to a printed circuit board (PCB) (20) (See Figure 2).

In regards to claim 38, Li fails to disclose the following:

a) contact pads.

However, Plepys et al. ("Plepys") discloses a semiconductor device with contact pads (See Column 2 Line 7). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include contact pads as disclosed in Plepys because it permits external connections with integrated circuit chips.

b) a ring shaped stiffener being centrally open in a first surface and a second surface, wherein said first surface of said ring shaped stiffener is attached to said first surface of said substrate.

However, Plepys discloses a semiconductor device with a stiffener (See Column 2 Line 8). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include a stiffener as disclosed in Plepys because it aids in removing heat from the chip.

In regards to claim 4, Li discloses the following:

a) second heat spreader surface is plated with solder that allows said second heat spreader surface to be surface mounted to soldering pads on the PCB (See Column 2 Lines 9-10).

In regards to claim 5, Li discloses the following:

a) substrate has a window opening that is open at said first surface and said second surface of said substrate (See Figure 2).

In regards to claim 6, Li discloses the following:

a) an integrated circuit (IC) die that is mounted to said first surface of said heat spreader and is accessible through said window opening (See Figure 2).

In regards to claim 8, Li discloses the following:

a) die (30).

In regards to claim 8, Li fails to disclose the following:

a) a contact pad.

However, Plepys discloses a semiconductor device with contact pads (See Column 2 Line 7). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include contact pads as disclosed in Plepys because it permits external connections with integrated circuit chips.

b) a wire bond that couples said contact pad to said first substrate surface of said heat spreader.

However, Plepys discloses a semiconductor device where (See Figure 2). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include a semiconductor device where the wire couples a contact pad corresponding to a trace on the substrate as disclosed in Plepys because it permits an electrical connection to be made among components in the device.

In regards to claims 42 and 64, Li discloses the following:

a) heat spreader is substantially planar (See Figure 2).

In regards to claims 43 and 65, Li discloses the following:

a) a thermally conductive adhesive that attaches said first surface of said heat spreader to said second surface of said substrate (See Column 2 Lines 1-15).

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In regards to claim 44, Li fails to disclose the following:

a) a thermally conductive adhesive that attaches said first surface of said ring shaped stiffener to said first surface of said substrate.

However, Plepys discloses a semiconductor device with a stiffener (See Column 2 Line 8). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include a stiffener as disclosed in Plepys because it aids in removing heat from the chip.

In regards to claim 45, Li fails to disclose the following:

a) ring shaped stiffener comprises at least one metal.

However, Plepys discloses a semiconductor device with a copper stiffener (See Column 6 Lines 61 and 62). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include a copper stiffener as disclosed in Plepys because it provides good dielectric properties which aid in removing heat from the chip.

In regards to claim 46, Li fails to disclose the following:

a) at least one metal includes copper.

However, Plepys discloses a semiconductor device with a copper stiffener (See Column 6 Lines 61 and 62). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include a copper stiffener as disclosed in Plepys because it provides good dielectric properties which aid in removing heat from the chip.

In regards to claims 48 and 67, Li discloses the following:

a) a plurality of solder balls attached to said plurality of solder ball pads (See Figure 2).

In regards to claim 49, Li fails to disclose the following:

a) an outer surface of said ring shaped stiffener is flush with an outer edge of said substrate.

However, Plepys discloses a semiconductor device with a stiffener (See Column 2 Line 8). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include a stiffener as disclosed in Plepys because it aids in removing heat from the chip.

In regards to claim 50, Li discloses the following:

a) an encapsulating material that fills a cavity formed by said window opening (See Figure 1).

In regards to claim 50, Li fails to disclose the following:

a) ring shaped stiffener and said first surface of said heat spreader to encapsulate said IC die.

However, Plepys discloses a semiconductor device with a stiffener (See Column 2 Line 8). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include a stiffener as disclosed in Plepys because it aids in removing heat from the chip.

In regards to claim 60, Li discloses the following:

- a) a substrate (See Figure 2);
- b) a plurality of solder ball pads on a second surface of said substrate (See Figure 2);
- c) a window opening (See Figure 2);



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d) a heat spreader that has a first surface and a second surface, wherein said first surface of said heat spreader surface is attached to said second surface of said substrate (See Figure 2); and

e) an IC die mounted to said first surface of said heat spreader that is accessible through said window opening; wherein said second surface of said heat spreader is capable of being coupled to a printed circuit board (PCB) (See Figure 2).

In regards to claim 60, Li fails to disclose the following:

a) contact pads.

However, Plepys discloses a semiconductor device with contact pads (See Column 2 Line 7). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include contact pads as disclosed in Plepys because it permits external connections with integrated circuit chips.

8. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Li (U.S. Patent No. 6,163,458) in view of Plepys et al. (U.S. Patent No. 6,140,707) and Kalidas et al. (U.S. Patent No. 6,084,777).

In regards to claim 3, Li fails to disclose the following:

a) outer profile of said heat spreader overlaps with an inner profile of said ring shaped stiffener.

However, Kalidas discloses a semiconductor device where the heat spreader overlaps with the stiffener (See Figure 2). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include an overlap between the heat spreader and stiffener as disclosed in Kalidas because an electrical connection is made to the heat spreader, which serves as a ground plane, that aids in reducing resistance in the package.

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9. Claims 7, 11, 12, 47 and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li (U.S. Patent No. 6,163,458) in view of Plepys et al. (U.S. Patent No. 6,140,707) and Chia et al. (U.S. Patent No. 6,002,169).

In regards to claims 7 and 12, Li discloses the following:

a) die (30) has a surface that includes a contact pad (32) (See Figure 2).

In regards to claims 7 and 12, Li fails to disclose the following:

a) a wire bond that couples said contact pad to a corresponding metal trace on said first substrate surface.

However, Chia et al. ("Chia") discloses a semiconductor device where the wire (140) couples a contact pad (123) corresponding to a trace (115) on the substrate (135) (See Figure 2). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include a semiconductor device where the wire couples a contact pad corresponding to a trace on the substrate as disclosed in Chia because it permits an electrical connection to be made among components in the device.

In regards to claim 11, Li fails to disclose the following:

a) integrated circuit (IC) die that is mounted to said first surface of said substrate.

However, Chia discloses a semiconductor device where the chip (120) is connected to the substrate surface (135) (See Figure 2). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include a die mounted to a substrate surface as disclosed in Chia to connect the chip to a printed circuit board or other peripheral components.

In regards to claim 47, Li fails to disclose the following:

a) at least one metal includes aluminum.

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However, Chia discloses a semiconductor device with an aluminum stiffener (See Column 2 Lines 63-67 and Column 3 Lines 1-10). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include an aluminum stiffener as disclosed in Chia because it aids in removing heat from the chip in an efficient manner.

In regards to claim 51, Li discloses the following:

- a) an encapsulating material that fills a cavity (See Figure 1).

In regards to claim 51, Li fails to disclose the following:

- a) ring shaped stiffener and said first surface of said heat spreader to encapsulate said IC die.

However, Plepys discloses a semiconductor device with a stiffener (See Column 2 Line 8). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include a stiffener as disclosed in Plepys because it aids in removing heat from the chip.

10. Claims 8, 8 and 66, as far as understood, rejected under 35 U.S.C. 103(a) as being unpatentable over Li (U.S. Patent No. 6,163,458) in view of Plepys et al. (U.S. Patent No. 6,140,707) and Meyer et al. (U.S. Patent No. 3,790,866).

In regards to claims 8 and 66, Li discloses the following:

- a) die (30).

In regards to claims 8 and 66, Li fails to disclose the following:

- a) a contact pad.

However, Meyer et al. ("Meyer") discloses a semiconductor device with contact pads (See Abstract). It would have been obvious to one having ordinary skill in the art at the time the

invention was made to modify the semiconductor device of Li to include contact pads as disclosed in Meyer because it permits external connections with integrated circuit chips.

b) a wire bond that couples said contact pad to said first substrate surface of said heat spreader.

However, Meyer discloses a semiconductor device where the wire bond contacts the heat sink and contact pad (See Abstract). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include a semiconductor device where the wire bond couples a contact pad to a heat spreader as disclosed in Meyer because it permits an electrical connection to be made among components in the device.

In regards to claim 9, Li discloses the following:

a) second surface of said heat spreader is coupled to a ground potential of the PCB (See Figure 2).

11. Claims 10 and 68 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li (U.S. Patent No. 6,163,458) in view of Plepys et al. (U.S. Patent No. 6,140,707) and Davies et al. (U.S. Patent No. 5,901,041).

In regards to claims 10 and 68, Li fails to disclose the following:

a) substrate is a tape substrate.

However, Davies et al. ("Davies") discloses a semiconductor device where the substrate is a tape substrate (See Abstract). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include a tape substrate as disclosed in Davies because it aids in improving electrical performance by reducing electrical parasites.

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12. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Li (U.S. Patent No. 6,163,458) in view of Plepys et al. (U.S. Patent No. 6,140,707), Chia et al. (U.S. Patent No. 6,002,169) and Desai et al. (U.S. Patent No. 6,166,434).

In regards to claim 13, Li fails to disclose the following:

a) die is mounted to said first surface of said substrate in a flip chip configuration, wherein a conductive bump on an active surface of said IC die is connected to a conductive pad on said first substrate surface.

However, Desai et al. ("Desai") discloses a semiconductor device where the die (100) is mounted via solder balls (104) to the substrate (106) (See Figure 1E). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include a semiconductor device where the die is mounted via solder balls to the substrate as disclosed in Desai to form an electrical connection among components.

13. Claims 16, 52, 53 and 57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li (U.S. Patent No. 6,163,458) in view of Plepys et al. (U.S. Patent No. 6,140,707), Chia et al. (U.S. Patent No. 6,002,169), Desai et al. (U.S. Patent No. 6,166,434) and Davies et al. (U.S. Patent No. 5,901,041).

In regards to claim 16, Li fails to disclose the following:

a) a second heat spreader attached to a non-active surface of said IC die and a said second surface of said ring shaped stiffener.

However, Davies discloses a semiconductor device where the heat spreader (18) is attached to the heat sink (42) and die (12) (See Figure 3). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor

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device of Li to include a heat spreader that is attached to the heat sink and die as disclosed in Davies because it removes excess heat from the package.

In regards to claim 52, Li fails to disclose the following:

a) second heat spreader is attached to said second surface of said ring shaped stiffener with a thermally conductive adhesive material.

However, Davies discloses a semiconductor device where the heat sink is attached to the stiffener (See Column 1 Lines 55-60). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include a heat sink attached to the stiffener as disclosed in Davies because it aids in removing excess heat from the package.

In regards to claim 53, Li fails to disclose the following:

a) second heat spreader is attached to said nonactive surface of said IC die with a thermally conductive adhesive material.

However, Davies discloses a semiconductor device where the heat spreader is attached to the heat sink and die with an adhesive (See Figure 3). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include a heat spreader that is attached to the heat sink and die with an adhesive as disclosed in Davies because it aids in removing excess heat from the package.

In regards to claim 57, Li fails to disclose the following:

a) second heat spreader is substantially planar.

However, Davies discloses a semiconductor device where the heat spreader is attached to the heat sink (See Figure 3). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include a heat

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spreader that is attached to the heat sink as disclosed in Davies because it aids in removing excess heat from the package.

14. Claims 17, 58 and 59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li (U.S. Patent No. 6,163,458) in view of Plepys et al. (U.S. Patent No. 6,140,707), Chia et al. (U.S. Patent No. 6,002,169), Desai et al. (U.S. Patent No. 6,166,434) and Davies et al. (U.S. Patent No. 5,901,041).

In regards to claim 17, Li fails to disclose the following:

a) a via located proximate to said mounted IC die that extends through said substrate, wherein said via is filled with a conductive material to couple said conductive bump to said heat spreader.

However, Davies discloses a semiconductor device that utilizes vias (See Column 2). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include vias as disclosed in Davies to establish an electrical connection among the components in the device.

In regards to claim 58, Li fails to disclose the following:

a) conductive material filling said via thermally couples said conductive bump to said heat spreader.

However, Davies discloses a semiconductor device that utilizes vias (See Figure 2). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include vias as disclosed in Davies to establish an electrical connection among the components in the device.

In regards to claim 59, Li fails to disclose the following:

a) conductive material filling said via electrically couples said conductive bump to said heat spreader.

However, Davies discloses a semiconductor device that utilizes vias (See Figure 2). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include vias as disclosed in Davies to establish an electrical connection among the components in the device.

15. Claims 39-41 and 61-63, as far as understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Li (U.S. Patent No. 6,163,458) in view of Kalidas et al. (U.S. Patent No. 6,084,777) and Atwood et al. (U.S. Patent No. 6,212,070).

In regards to claims 39 and 61, Li fails to disclose the following:

a) heat spreader comprises at least one metal.

However, Atwood et al. ("Atwood") discloses a semiconductor device that has a heat spreader comprised of copper or aluminum (See Column 5 Lines 23 and 24). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include heat sink comprised of aluminum or copper as disclosed in Atwood because it aids in exhibiting high thermal conductivity.

In regards to claims 40 and 62, Li fails to disclose the following:

a) at least one metal includes copper.

However, Atwood discloses a semiconductor device that has a heat spreader comprised of copper (See Column 5 Lines 23 and 24). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include heat sink comprised of copper as disclosed in Atwood because it aids in exhibiting high thermal conductivity.



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In regards to claims 41 and 63, Li fails to disclose the following:

- a) at least one metal includes aluminum.

However, Atwood discloses a semiconductor device that has a heat spreader comprised of aluminum (See Column 5 Lines 23 and 24). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include heat sink comprised of aluminum as disclosed in Atwood because it aids in exhibiting high thermal conductivity.

16. Claims 54-56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li (U.S. Patent No. 6,163,458) in view of Plepys et al. (U.S. Patent No. 6,140,707), Chia et al. (U.S. Patent No. 6,002,169), Desai et al. (U.S. Patent No. 6,166,434), Davies et al. (U.S. Patent No. 5,901,041) and Atwood et al. (U.S. Patent No. 6,212,070).

In regards to claim 54, Li fails to disclose the following:

- a) heat spreader comprises at least one metal.

However, Atwood et al. ("Atwood") discloses a semiconductor device that has a heat spreader comprised of copper or aluminum (See Column 5 Lines 23 and 24). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include heat sink comprised of aluminum or copper as disclosed in Atwood because it aids in exhibiting high thermal conductivity.

In regards to claim 55, Li fails to disclose the following:

- a) at least one metal includes copper.

However, Atwood discloses a semiconductor device that has a heat spreader comprised of copper (See Column 5 Lines 23 and 24). It would have been obvious to one having ordinary

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skill in the art at the time the invention was made to modify the semiconductor device of Li to include heat sink comprised of copper as disclosed in Atwood because it aids in exhibiting high thermal conductivity.

In regards to claim 56, Li fails to disclose the following:

a) at least one metal includes aluminum.

However, Atwood discloses a semiconductor device that has a heat spreader comprised of aluminum (See Column 5 Lines 23 and 24). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include heat sink comprised of aluminum as disclosed in Atwood because it aids in exhibiting high thermal conductivity.

### ***Double Patenting***

17. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

18. Claims 3-13, 16, 17 and 38-68 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-13 of U.S. Application No. 09/997,272. Although the conflicting claims are not identical, they are not patentably distinct from each other because they both claim a ball grid array package.

19. Claims 3-13, 16, 17 and 38-68 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 and 11-13 of U.S. Application No. 09/984,259. Although the conflicting claims are not identical, they are not patentably distinct from each other because they both claim a ball grid array package.

20. Claims 3-13, 16, 17 and 38-68 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-33 and 57 of U.S. Application No. 09/742,366. Although the conflicting claims are not identical, they are not patentably distinct from each other because they both claim a ball grid array package.

### ***Conclusion***

21. Applicant is advised that should claim 58 be found allowable, claim 59 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

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22. The following prior art made of record and not relied upon is considered pertinent to applicant's disclosure: a) Mertol (U.S. Patent No. 6,011,304) discloses a stiffener ring attachment with holes; b) Niwa (U.S. Patent No. 5,998,241) discloses a semiconductor device which includes a tape carrier and heat spreader; c) Shim et al. (U.S. Patent No. 5,905,633) discloses a ball grid array semiconductor package; d) Wilson et al. (U.S. Patent No. 5,572,405) discloses a thermally enhances ball grid array package; e) Johnson (U.S. Patent No. 5,883, 430) discloses a thermally enhanced flip chip package; f) Lo et al. (U.S. Patent No. 5,691,567) discloses a heat spreader/heat slug structure; g) Wyland (U.S. Patent No. 5,986,885) discloses a semiconductor with an internal heatsink; h) Chen (U.S. Patent No. 6,077,724) discloses multi-chips semiconductor package; i) Wu (U.S. Patent No. 6,162,659) discloses a heat spreader for integrated chips; j) Dordi (U.S. Patent No. 5,835,355) discloses a tape ball grid array with a metal stiffener; k) Sterns et al. (U.S. Patent No. 6,160,705) discloses a ball grid array package using enhanced power and ground distribution circuitry; l) Wang et al. (U.S. Patent No. 5,977,626) discloses a thermally enhanced PBGA package; m) Nagarajan et al. (U.S. Patent No. 6,133,064) discloses a flip chip ball grid array package; n) Marrs et al. (U.S. Patent No. 5,583,378) discloses a ball grid array integrated circuit; o) Chillara et al. (U.S. Patent No. 5,648,679) discloses a tape ball lead integrate circuit; p) Chiang et al. (U.S. Patent No. 5,736,785) discloses a semiconductor package for improving the capability of spreading heat; q) Chen et al. (U.S. Patent No. 5,903,052) discloses a structure for a semiconductor package; r) Carichner et al. (U.S. Patent No. 5,972,734) discloses a interposer for a BGA package; s) Mertol et al. (U.S. Patent No. 6,114,761) discloses a thermally enhanced flip chip; t) Hembree (U.S. Patent No. 6,117,797) discloses an attachment method for heat sinks; u) Iijima et al. (U.S. Patent

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No. 6,347,037) discloses a semiconductor device; v) Rahim (U.S. Patent No. 6,362,525) discloses a circuit structure including a passive element; w) Ogawa (Japanese Patent No. 10-50877) discloses a semiconductor package; x) Otaka et al. (Japanese Patent No. 2001-68512) discloses a tab tape stiffener; and y) *Performance and Reliability of a Cavity Down Tape BGA Package*.

23. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monica Lewis whose telephone number is 703-305-3743. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 703-308-4940. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7722 for regular and after final communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

ML  
October 2, 2002

  
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